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# Systems Approach to Link Big Socio-ecological Geo-data to Food Systems Sustainability

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**Abstract:** Rapid development of multi-dimensionally, multi-scale, timely updated socio-ecological geo-data presents an opportunity as potential information resource for supporting effective decision-making of stakeholders involved with food systems, from daily routines of individuals to strategic decisions of manager and policy-makers. However, the use of this type of big data toward supporting the sustainability of food systems at different scales still fall short of (i) what information commonly needed by food system actors to response and adapt to socio-ecological change and enhance the system performance, (ii) interoperability between different types of data across scales, and (iii) sufficient guidance to utilize big data resources for diverse users' contexts and needs. In this review-based and conceptual analysis, we propose a framework with functional blocks for designing integrated agro-informatics systems that organize uses of big socio-ecological data for research and development with an orientation to food system sustainability. These functional blocks are (1) information need assessment, (2) use cases library development, (3) interoperability improvement, (4) pattern-trend discovery and (5) feedback management including co-learning. A typical use-case is a sequence of limited steps that describes the interactions between a typical user and the information system to accomplish a typical goal. Use cases library consists of as many as possible typical use cases to cope with diverse use needs. Interoperability improvement focuses on critical interfaces such as between quantitative and qualitative data, and place-based and flow-based data (e.g. agroecology vs. value chains). We illuminate the concept and discuss its potential benefits with a pilot project on web-based GIS for SLM options-by-context (SLM: Sustainable Land Management) initiated by CGIAR Research Program on Dryland Systems.

**Keywords:** big data, food systems, socio-ecological, sustainability, use cases library, Dryland Systems